

The pressure increases immediately, and 'stops' when equilibrium is established. The spectroscopic phenomena are always followed and compared at the beginning and when equilibrium is established.

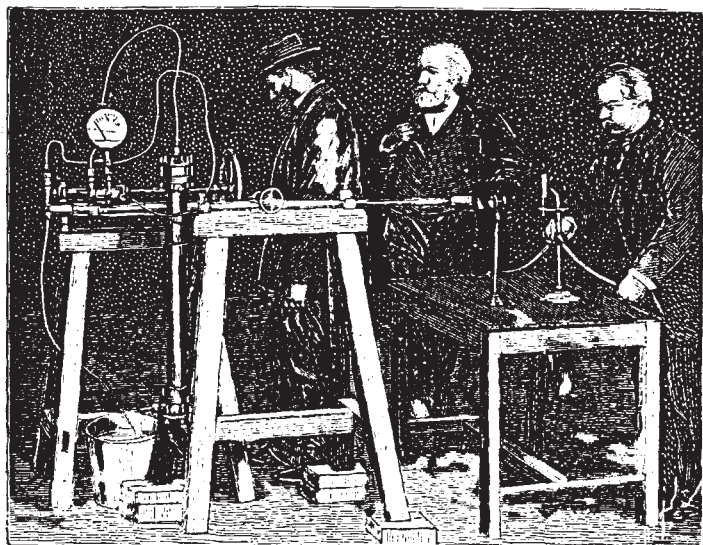


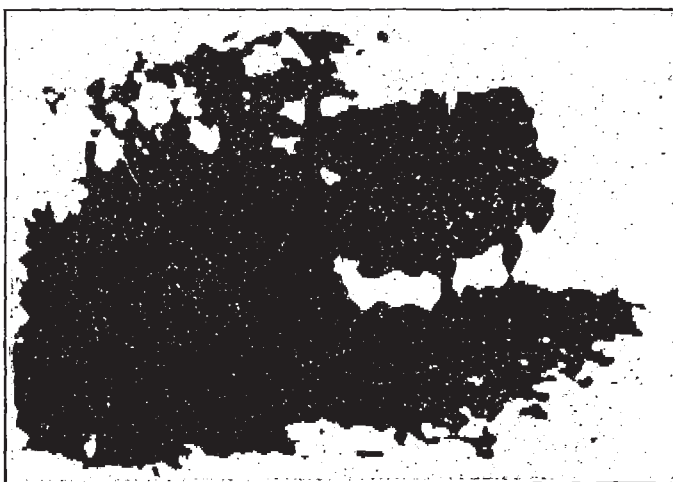
FIG. 2.—Apparatus for experiments at high pressure.

In the experiments made with the tube of two metres in length, and with gaseous pressures up to 100 atmosphere, perceptible modifications in the length of the spectrum observed have not been noted. The attained temperatures have been estimated between 800° and 900° , according to the spectrum given by the spiral.

To obtain higher temperatures it is necessary to increase the power of the electric generators, and that is what it is proposed to do; but it must be observed that the solar phenomenon point of view, it is the exterior and middle parts of the coronal atmosphere which interest us most. It is those which, if they contain oxygen, would, above all the others, produce steam, by reason of their lower temperatures. But temperatures of 800° and 900° , which have already been realised, correspond to the deep parts of the coronal atmosphere, and in these, as well as in those which are more exterior, and consequently colder, the absence of oxygen may be affirmed.

PHOTOGRAPH OF A LANDSCAPE IN LIVING AND DEAD BACTERIA.

A FILM of living bacteria in Agar was distributed over very thin (cover-slip) glass sterilised; this thin glass alone separated the film from the negative. After exposure over a mirror for two hours, and then forty-eight hours' incubation, the bacteria behind the transparent parts of the negative were killed; those behind the opaque parts developed normally; those partly protected were retarded, giving the half tones. The photograph was sharper when first made, several weeks before reproduction.



the Swedish naturalists Bjorling and Kallstenius were wrecked in the schooner *Ripple* in 1892, and will also search at Cape Faraday and Clarence Head to ascertain the fate of the

NOTES.

LORD KELVIN has been awarded the Grande Médaille of the Société d'Encouragement pour l'Industrie Nationale of Paris, for his scientific works. Among other awards we note the fol-

lowing: 3000 francs to M. Dulac for a means of diminishing smoke at industrial centres; 1000 francs to MM. Fuchs and de Launay for their work "Gites Minéraux"; and 500 francs to M. Chapel for his "Caoutchouc et la Gutta-Percha"; 2000 francs to Prof. Roberts-Austen for his work on alloys (see *NATURE*, June 7); 1500 francs to M. Pagnoul; and 500 francs to the Société d'Agriculture in the Meaux district, for investigations on the comparative physical nature and chemical constitution of the soils of certain regions.

AFTER a long illness the Right Hon. Sir Henry Layard passed away on July 5, at the age of seventy-seven. His excavations at Nineveh and Babylon, and his travels through various parts of Asia, have made his name eminent among archaeological investigators and discoverers.

WE regret to record the death at Paris of M. Mallard, the Professor of Mineralogy in the École Nationale Supérieure des Mines.

THE *Times* correspondent at Calcutta telegraphs that, since the beginning of the rainy season, the water in the Gohna Lake has been rising about two feet daily, and is now 160 feet from the top of the dam. As percolation has begun through the dam, and is increasing with the increased pressure, it is thought that the overflow will probably not occur before the middle of September.

A REUTER telegram from St. John's, dated July 7, states that the Peary Auxiliary Expedition has sailed on board the steamer *Falcon* for Inglefield Gulf, Greenland, to bring home Lieut. Peary's party. They will call at Carey Island, where

naturalists. The party will explore Jones's Sound and make a chart of the coast, returning to Bowdoin Bay for Lieut. Peary on September 1. The expedition is expected to return by September 20. Dr. Ohlin, the Swedish zoologist, and Messrs. Chamberlain and Libbey, represent the scientific side of the party, which is under the leadership of Mr. Bryant.

DR. M. A. VEEDER informs us that the Jackson-Harmsworth Polar Expedition, which starts from London to-day (see p. 255) for an extended sojourn in the Arctic regions, will co-operate in observation of the aurora upon the concerted plan which is in use by a large number of observers in various parts of the earth, and by the expeditions of Lieut. Peary and Dr. Nansen. This, together with what has already been done, insures the continuance and perfecting of these observations, which are having results that promise to be of great practical value both to astronomical and meteorological science, as well as to the study of physics in general.

AT the last meeting of the Physical Society it was announced that in future the meetings of the Society will be held in the rooms of the Chemical Society, Burlington House. Since its foundation in 1874 the Society has met in the Physical Lecture Theatre of the Royal College of Science.

VIOLENT earthquake disturbances were experienced in Constantinople on Tuesday afternoon. The first shock occurred shortly after noon, and is said to have lasted twenty seconds. Another wave was felt at four o'clock. In both cases the direction of motion appears to have been from east to west. About the same time, a severe earthquake was also felt at Smyrna and Scio, and in the Dardanelles.

MISS ORMEROD, writing to the *Times* of Saturday last, mentions that bad attacks of the grass-destroying caterpillars of the antler moth are now occurring in some localities in Scotland. She says that in 1884 these caterpillars devastated an area of about ten miles in extent of the mountainous parts of Glamorganshire, and in 1885 spread over an area of about seven by five miles in Selkirkshire, N.B. The district infested at present is that in which the voles not long ago did so much damage, and Prof. Wallace reports that the caterpillars are doing even more mischief than the voles.

THUNDERSTORMS again occurred in nearly all parts of Great Britain on the 6th inst., and were reported at places during several subsequent days; the disturbance appears to have been caused by a shallow barometric depression advancing northwards from the south-west of France. The thunderstorms were again preceded by abnormally high temperatures, especially over the eastern and southern parts of England, where the thermometer rose above 85°, while at Rochefort, in France, the maximum temperature in the shade rose to 99° on the 5th. Some very heavy falls of rain have also been reported, the total in two days amounting to about three inches in the south-west of Ireland, and quantities of considerably over an inch in twenty-four hours fell in Scotland and the south of England. The average rainfall since the beginning of the year has now been about reached, or exceeded, in all districts except the midland parts of England; in Scotland the average has been exceeded by about five inches.

AT a Council meeting of the Pharmaceutical Society of Great Britain, last week, Mr. Martindale moved the following resolution:—"That after the first day of January, 1895, a practical knowledge of the metric system of weights and measures shall be required of all candidates for the Minor examination in the subjects of prescriptions and practical dispensing, and that the Board of Examiners be instructed to require from candidates a general knowledge of posology in terms of the metric as well

as the British system of weights and measures as defined by the British Pharmacopœia, 1885; and in practical dispensing 'to weigh, measure, and compound medicines by the metric as well as the British system of weights and measures.' After some discussion the resolution was altered to the effect that the Board of Examiners should be requested to consider the advisability of acquiring a practical knowledge of the metric system of weights and measures for the Minor examination. In this form it was carried.

WE regret to note that the recently issued report of the Council of the Marine Biological Association states that there is no immediate prospect of a satisfactory boat being obtained by the Association: the question is purely a financial one, and its solution is only to be found in the generosity of public companies or private individuals. The Council points out that it is impossible that a sea-going boat can be purchased out of income, so long as the revenue of the Association is so small. During the past year the work of collection has been largely carried out by means of hired vessels, a method both expensive and unsatisfactory. As to scientific investigations, we read that, during the past year, both Mr. Cunningham and Mr. Holt continued their inquiries into the various questions relating to the maturity of food-fish which were so prominent last year before the House of Commons Select Committee on Sea Fisheries, and upon which much information is still required. More important, perhaps, is the fact that Mr. Cunningham has finally settled by direct experiment the much debated question of the identity of the egg of the pilchard. He has been able to rear the larvæ of plaice, hatched and fertilised in the aquarium at Plymouth, to the age of thirty-seven days; no flat-fish larvæ had previously been reared in confinement from the ovum to this age, and the result is of great economic value.

THE German Fisheries Association offers prizes of 800, 1000, and 600 marks, respectively, for the best works on the following subjects:—(1) Simple, trustworthy, and generally applicable methods for the determination of the gases oxygen, carbonic acid, and nitrogen found in natural waters, or at least of the first two, special importance being attached to methods independent of the higher resources of the chemical laboratory. Competitors to send in before June 1, 1895. (2) Investigations concerning the pathological and anatomical effects upon fishes of the following bodies found in drain-waters:—Free acids, free bases, especially lime, ammonia, soda, and the soluble carbonates of potash and soda; free bleaching gases, such as chlorine and sulphurous acid. Further, the determination of the symptoms of suffocation from these causes. Partial and even negative answers are not excluded. Representatives of the Salmonidæ and Cyprinidæ families are recommended for investigation. Papers to be sent in before November 1, 1896. (3) The development and conditions of life of the water fungus *Leptomitius lacteus*, and its appearance and disappearance in polluted waters. Papers to be sent in before November 1, 1895. All papers for the competition are to be sent in registered envelopes to the General Secretary, Prof. Dr. Weigelt, Berlin, S.W., Zimmerstrasse 90, 91. They may be written in German, French, or English, and are to be provided with a motto and with the name and address of the author in a sealed envelope bearing the same motto. The object of the Association is to throw light on the pollution of natural waters by animal and industrial refuse. The withdrawal of the gases mentioned, which have an intimate relation to the amount of putrifying matter, is difficult to prove. The symptoms of death due to pollution by free acids and other poisons are not as yet very well known. Sugar and starch factories send drain-waters into the rivers, which offer ample sustenance to the white river algæ, especially *Leptomitius lacteus*. These may be regarded as having a purifying effect, but the de-

composition of the dead floating masses gives rise to further pollution. An examination of the habits of this plant appears, therefore, highly desirable in the interests of the inland fisheries. The judges are Drs. Fleischer, König, Tiemann, Hermann, Nitsche, Virchow, Hulwa, Kirchner, Magnus, and Weigelt.

AN investigation by Prof. W. J. Sollas, F.R.S., "On the Relation of the Granite to the Gabbro of Barnavave, Carlingford" (*Trans. Royal Irish Academy*, vol. xxx. part xii. 1894), has added facts of considerable importance to what was previously known about the mountain groups of Carlingford and Slieve Gullion, which rise from the centre of the Palæozoic tract of the counties of Louth and Armagh, and represent the remains of extinct volcanoes of the Tertiary period. From an examination of the district, and a study of rock-sections from it, the following statements are deduced:—(1) The gabbro of the Carlingford district is older than the granite which penetrates it. (2) The gabbro was already completely solid, traversed by contraction joints, and probably fractured by earth movements, before the injection of granophyric material. (3) The granophyric material was in a state of great fluidity at the time of its intrusion. The granophyric dykes are in no case contemporary veins. The results of the investigation suggest to Prof. Sollas some reflections on the difficult question of the "differentiation of originally homogeneous igneous magmas." In his opinion, "much more attention must be given to the investigation of the details of the now prevalent differentiation hypothesis before it can be regarded as established on a firm basis." In fact, the importance of this paper as a contribution to physical geology is liable to be overlooked, owing to the topographical nature of its title; but it soon becomes apparent to the reader that the close intermingling of rocks of different composition which has taken place at Barnavave is not likely to be an exceptional occurrence. The proofs of microscopic penetration of the gabbro by the granite, until a bulk-analysis of any specimen would be most misleading, are interesting to all geologists, and practically open a new field of observation. A severe blow is struck at the whole theory of "segregation veins," or "contemporary veins," which has perhaps been maintained too academically, and without complete confirmation in natural exposures. It is worth noting that this memoir is issued separately by the Royal Irish Academy, like all those published in their *Transactions*.

In a paper published in the *Electrotechnische Zeitschrift*, in which he described a new form of gas voltameter, Prof. Kohlrausch expressed his surprise that the gas voltameter was so seldom used for measuring currents. The reason for this state of affairs is probably to be found in that the form of gas voltameter ordinarily in use is both inaccurate and troublesome to use. A new form of gas voltameter has recently been devised by Herr H. A. Naber, of Amsterdam, which embodies several improvements. The burette in which the gas evolved (either hydrogen or oxygen) is collected, can be turned about a vertical axis so as to bring its lower end over the electrode, and thus start or stop the collection of gas at any given time without breaking the current passing through the voltameter. By means of an auxiliary vessel into which air can be driven, the level of the liquid inside and outside the burette can be made the same, so that there is no correction to be applied to the barometric pressure in order to find the pressure under which the gas is measured. The burette is fitted with a tap, so that the oxygen or hydrogen evolved can be passed into another vessel and collected. The whole of the apparatus is constructed of glass, except, of course, the electrodes, which are of platinum, and are so arranged that the two gases evolved can never possibly mix, and thus cause an explosion, if by any chance the platinum of the electrodes becomes exposed to this mixture of gases.

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A NEW form of automatic steering compass has been invented by Lieut. Bersier, of the French Navy, and a very full description is published in *La Nature* for June 25. The difficulty with any form of automatic compass is that any arrangement by which the compass card makes or breaks a mechanical contact when the course deviates from a straight line will interfere with the free set of the needle. Lieut. Bersier, in his compass, uses a spark from a Ruhmkorff coil, which passes between a metal point on the edge of the compass card and one of two semi-circular metal plates fixed to and insulated from the sides of the compass bowl. These metal plates are connected to two small electromagnets, and when the electric current which forms the spark passes, it closes the circuit of a small motor which actuates the steering gear. If the spark passes to one plate the motor works in one direction, while if the spark passes to the other plate the motor works in the reverse direction; so that it is only when the point on the card is half-way between the two metal plates that the rudder is amidships. It is said that the new compass has been tried in the French Navy for several months past, and has given entire satisfaction, which, considering the very delicate and complicated nature of the mechanism employed, is very remarkable. The new form of compass can be made to automatically register the course steered, the spark being caused to pierce a band of paper which is moved by clockwork.

In a short paper communicated to the Johns Hopkins University *Circular*, Mr. A. S. Mackenzie describes some experiments he has conducted to test the validity of the Newtonian law of attraction for crystalline and isotropic masses at small distances. In discussing the elastic solid theory of refraction in physical optics, it is often customary to introduce an optical density which may be different in different directions. In uniaxial crystals there are two such directions, and in the case of Iceland spar the square roots of the densities are as 1.486 to 1.658. Thus the question arises, does this property depend upon the distribution of the mass with reference to the optic axis? and if so, could a crystal attract a particle in a manner dependent upon the position of the particle with reference to the optic axes of the crystal, so that it would act as if it were of greater mass (and therefore density) in one direction than in another? It is to elucidate this point that the author has been conducting a series of experiments, using for this purpose a form of apparatus which, at any rate as far as the magnitude and suspension of the attracted masses are concerned, resembles that used by Prof. Boys. The apparatus, however, is designed for relative rather than absolute measurements. Although the greatest divergence between any two results only amounted to 1 part in 200, no difference in the attraction of a crystalline mass along, and at right angles to, the axis was discovered. A second set of experiments was undertaken in which the attracting masses were isotropic, but in which the distances between the attracting and attracted masses was varied, with a view of testing the law of the inverse square of the distance. The form of apparatus used seems particularly ill-suited to test this point, as the distances between the centres of the masses are very hard to measure. The author, however, says these distances could be measured to within $\frac{1}{10}$ mm., and he finds that while the deflections as calculated, assuming the correctness of the inverse square law for distances of about 7.4, 5.5 and 3.6 cm. between the centres of the large and small masses were as 1 : 2.05 : 5.25, while the observed deflections were as 1 : 2.04 : 5.24. So that the Newtonian law has been found to be true for the attractions of non-isotropic, and for isotropic masses at distances apart as small as 3 or 4 cm.

In the *Modern Medicine and Bacteriological Review* for May, attention is called to a subject which is attracting special in-

terest just now amongst bacteriologists—the existence of sub-varieties of microbes of specific species. We have frequently referred in these notes, directly and indirectly, to the polymorphism exhibited by one and the same variety of micro-organism when submitted to different conditions of environment, &c., whilst Prof. Percy Frankland has repeatedly shown how the power of fermenting various solutions may not only be imparted to particular microbes by suitable training, but also removed from them. M. Péré has recently shown that there exist many sub-varieties of the bacillus *coli communis*, and Dr. Sanarelli has demonstrated the same in a series of investigations, conducted under Prof. Metchnikoff, for the typhoid bacillus, whilst the list of pseudo and other cholera vibrios is fast becoming unmanageable. The desirability of a due recognition of the fickleness of microbes to prescribed forms, &c., in the diagnosis of disease, where the bacteriological evidence is regarded of first importance, is obvious to all; whilst at the same time it is but one of the difficulties which a larger horizon has placed in the path of the bewildered bacteriologist. The other microbial notes are mainly on subjects already reviewed in these columns, whilst the medical articles are too technical to admit of reference here.

AN interesting account of hereditary malformation of the hands and feet is contributed by Drs. W. Ramsay Smith and J. Stewart Norwell to the *British Medical Journal*. In the subjects examined, the malformations in the hands affected the middle and ring fingers. These fingers were webbed to the tips, and the bones were disposed in an extraordinary manner. For instance, on the left hand the tip of the middle finger looked as if it were twisted in front of the ring finger, while the nails, which in the right hand were in the same plane, formed in the left a well-marked angle with one another. Each foot of the subjects had six toes. The second and third toes were webbed almost to the first interphalangeal joints, and the first and sixth toes up to the nail, while the fourth toe was comparatively free. It is not so much the striking abnormalities that are interesting, however, as the persistency and consistency with which the malformation has affected several generations. Taking back the history of the case as far as they could investigate it, the authors found that twenty-one out of twenty-eight of the family were malformed. An important point in this record is that malformation of the hands was always associated with malformation of the feet. In no instance was there a malformation of the hands alone or of the feet alone; and the malformation, as far as could be ascertained, showed very little variation. Another point is that it seemed to go very much in the female line. It is also remarkable that the wife of one of the subjects had been married previously, and had borne three children by her first husband, nevertheless all the children of the second husband inherited the malformation possessed by him.

MESSRS. BLACKIE AND SON have published the third part of Prof. F. W. Oliver's translation of Prof. Kerner's "Natural History of Plants."

MESSRS. WILLIAMS AND NORGATE have issued a list of new scientific works published in German, French, and other foreign languages. The list is No. 59 of their scientific series of foreign book circulars.

WE have received an advance copy of the eleventh annual report presented to the Chemical Section of the American Association for the Advancement of Science, by the Committee on indexing chemical literature. The report consists of a descriptive list of bibliographies published during last year.

Some very interesting reminiscences of the late Rev. Leonard Blomefield, together with a portrait of him, are given by Mr. H. H. Winwood in the *Proceedings* of the Bath Natural History

and Antiquarian Field Club (vol. iii. No. 1). Mr. Blomefield was the founder of the Club, in 1855, and took the warmest interest in its work up to the time of his death in September last.

PART ii. of volume lvii. of the *Journal* of the Royal Statistical Society has just been published. Mr. Charles Booth's paper, "Statistics of Pauperism in Old Age," and the discussion on it, as submitted at the meeting of the Society in March, is contained in this number. The paper forms the first part of a volume since published by Messrs. Macmillan. Two other papers are included in the *Journal*, viz. "Conditions and Prospects of Popular Education in India," by Mr. J. A. Baines, and "Modes of Census-Taking in the British Dominions," by Mr. R. H. Hooker.

WE stated some time ago that the United States Hydrographic Office was collecting information with the view of publishing a monthly Pilot Chart of the North Pacific Ocean. The first chart, for the month of July, has now been issued, and contains, among other useful information, data showing the calms and prevailing winds, the currents, and mean isobars drawn for Greenwich noon, for that month. The chart is at present far from complete, because of the limited number of observations in unfrequented portions of the ocean; nevertheless it is a good beginning, and no doubt the appeal made to observers to co-operate in the work will eventually enable the hydrographer to fill in the details where they are now wanting.

EVERY student of physics knows Deschanel's "Natural Philosophy," by Prof. J. D. Everett, F.R.S. For many years this treatise, and that by Ganot, have been the standard works for classes in elementary physics, and the thirteenth edition, just published by Messrs. Blackie and Son, will enable this position to be maintained for some time to come. It is well known that the work is not merely a translation; in fact, Deschanel's "Traité de Physique" only forms a basis upon which Prof. Everett has constructed an invaluable text-book. So many are the additions to the new edition that three pages of the volume are taken up with the enumeration of them. The work has been entirely recast, much of the old matter has been rearranged, and new matter has been largely introduced. Part II. contains a new chapter on Thermodynamics, in which free use is made of the methods of the Differential Calculus. An explanation of entropy, Dewar's experiments, and Van der Waal's theory with respect to the departure of gases from Boyle's law, are among the many additions to this part. Two new chapters have been added to Part III. (Electricity and Magnetism), and much of the antiquated matter has been omitted. Very extensive changes have also been made in the optical portion of Part IV., and a new chapter has been introduced dealing with systems of co-axial lenses. These judicious revisions and expansions have resulted in the production of a work which bears the same relation to physics of to-day that the original treatise did to the state of physical knowledge at the time of publication. The work may, therefore, be expected to be just as successful in the future as it has been in the past.

THE nature of the explosive decomposition of the ammonium and mercury salts of diazoimide, N_3H , forms the subject of a communication to the *Annales de Chimie et de Physique*, by MM. Berthelot and Vieille. The ammonium salt, N_3NH_4 , was obtained in large, brilliant, transparent crystals by the method of Curtius, the action of ammonia upon diazohippuramide suspended in alcohol and recrystallisation from water. The crystals may be handled without much danger of explosion if due care is taken. They sublime at the ordinary temperature *in vacuo*. The pressure produced during their explosion has been determined in a small steel cylinder provided with piston and registering apparatus; a similar cylinder of copper was

burst by the violence of the explosion. The pressure produced was found to be equal to that of one of the gunpowders recently tested by M. Berthelot, but the combustion appears to be a relatively slow one; the temperature of deflagration is about 1350° – 1400° . Hence the ammonium salt of diazoimide is a remarkable explosive on account both of the force developed during explosion and of its low temperature of deflagration. The products of the decomposition are ammonia, hydrogen and nitrogen. The ammonia was actually liquefied in the cylinder. The temperature is not sufficiently high to dissociate ammonia, so that there is first a decomposition into ammonia and diazoimide and then a subsequent decomposition of the latter into its elements. This probably accounts for the extreme force of the explosion, the energy which would otherwise have been absorbed in effecting the dissociation of the ammonia being available in the explosion. The mercurous salt of diazoimide, N_6Hg_2 , was obtained by precipitating a dilute aqueous solution of the ammonium salt with mercurous nitrate. The precipitate requires very careful washing and drying, owing to its highly explosive character. Its explosive decomposition is extremely rapid, analogous to that of fulminate of mercury, and the temperature of deflagration high, about 2700° . The mercuric salt, N_6Hg , may be conveniently obtained from the mercurous salt by decomposing it with sulphuric acid, and treating the solution of diazoimide thus prepared with freshly precipitated yellow mercuric oxide. The greater portion of the salt separates as a white precipitate, but it is somewhat soluble in cold water, and very considerably soluble in hot water, from which long acicular crystals are deposited on cooling. It is the most dangerously explosive of the salts investigated, and the experiments have unfortunately had to be abandoned on account of serious accidents to M. Berthelot's assistants. It is much more sensitive and therefore more dangerous than fulminate of mercury, and explodes when least expected and in a most violent manner. It furnishes the same volume of gaseous products of decomposition as fulminate of mercury.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*) from India, presented by Mr. Conrad W. Cooke; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mrs. Wheeler; a Cheetah (*Cynalurus jubatus*) from Somali-land, presented by Mr. William Mure; four Hedgehogs (*Erinaceus europæus*), British, presented by Mr. F. C. Smith; two Senegal Touracous (*Corythaix persa*) from West Africa, presented by Miss E. B. Redwar; a — Falcon (*Falco*, sp. inc.) captured at sea, presented by Mr. Arthur L. Sclater; four — Anolises (*Anolis*, sp. inc.) from North America, presented by the Southern Curio Company; a Crowned Lemur (*Lemur coronatus*) from Madagascar, three — Opossums (*Didelphys*, sp. inc.) from South America, deposited; two Obsolete Tinamous (*Crypturus obsoletus*) from Brazil; a Smooth Snake (*Coronella lavis*) from Austria, purchased; three Indian Cobras (*Naia tripudians*) from India, received in exchange.

OUR ASTRONOMICAL COLUMN.

THE SPECTRUM OF THE ORION NEBULA.—Two papers on the spectrum of the nebula in Orion are contained in the current number of *Astronomy and Astro-Physics*, one by Prof. J. E. Keeler, and the other by Prof. W. W. Campbell. The former observer photographed the spectrum of the nebula many times during last winter. A comparison, of the photographic and visual observations of nebular lines, with dark lines in the spectra of the Orion stars, indicates that an intimate relation exists between the two. "Indeed," says Prof. Keeler, "taking into account the relative intensities of the lines, the spectrum of Rigel may almost be regarded as the nebular spectrum reversed." Spectroscopists will remember that Dr. Huggins obtained an anomalous spectrum of the Orion nebula in 1889, his photo-

graph showing a large number of fine lines apparently connected with the spectra of the trapezium stars, while the hydrogen lines H_3 and H_4 were absent. Prof. Keeler has tried to obtain the same result by photographing the spectrum in the same way as Dr. Huggins, but without success. He shows that "contrary to the belief which has been held up to the present time, the trapezium stars have spectra marked by strong absorption bands; they have not the direct connection with the nebula that would be indicated by a bright-line spectrum, but are in fact on precisely the same footing (spectroscopically) as other stars in the constellation of Orion. While their relation to the nebula is more certain than ever, they can no longer be regarded as necessarily situated *in* the nebula, but within indefinite limits they may be placed anywhere in the line of sight." Finally, with regard to the appearances that have led to the belief that the nebular lines are bright in these stars, Prof. Keeler believes that they are of physiological and photographic origin, and do not actually exist. It is pointed out that these conclusions have an important bearing on theories of stellar development.

Prof. Campbell's paper, which is continued from the May number, deals with the spectrum of the Orion nebula and other well-known nebulae. In it Prof. Campbell brings together all his spectroscopic observations of nebulae. Like Prof. Keeler, he was unable to confirm Dr. Huggins' observation of the absence of certain hydrogen lines in the spectrum of the Orion nebula. His photographs also show that the spectra of the trapezium stars all conform to the Orion type, and contain numerous dark lines, but no bright lines. By tabulating the observations published up to the date of the paper, it is shown that of the twenty-five bright lines known to exist in the spectrum of the Orion nebula, at least nineteen are definitely matched by dark lines in the Orion stars, and at least fifteen by dark lines in the six faint stars situated in the dense parts of the nebula. Including his own observations, Prof. Campbell finds that thirty-six bright lines have been observed in the spectra of the seven nebulae examined by him. He has tabulated all the lines that have had their positions determined either from photographs or by direct observation.

THE NEBULOUS CHARACTER OF NOVA AURIGÆ.—The question of the telescopic appearance of Nova Aurigæ is again brought up in *Astronomische Nachrichten*, No. 3238, Prof. E. E. Barnard, at the end of a communication on micrometrical observations of the object, made with the 36-inch telescope of the Lick Observatory, says that when he examined the star on August 19, 1892, it appeared to be densely nebulous, and that since then it has not appreciably changed. He has made a very careful examination of the star in order to test whether the nebulousity was due to instrumental defects or not, and the result of his investigation is the conclusion that—"When the Nova is in the best possible focus it is hazy and surrounded for $5''$ or $6''$ with a decided nebulousity. . . . How much of this nebulousity is due to the peculiarity of the spectrum of the Nova, I am not able to tell. But from my experience with nebulae I would unhesitatingly say that the Nova is distinctly and unquestionably nebulous." This testimony, coming from such an experienced observer as Prof. Barnard, is very important. An inspection of the micrometrical observations made at the Lick Observatory, failed to show any marked periodic variation of the star's position, such as might be due to parallax. The object must therefore be at an enormous distance from us.

A series of observations of the relative position of Nova Aurigæ and a comparison star of magnitude 10.2, is also communicated to the same number of the *Astronomische Nachrichten* by F. Renz, of the Pulkowa Observatory. The observations extend from September 1892 to March 1894. The series shows no perceptible variation in the relative positions of the two stars. As regards the suspected nebulousity, Dr. Renz found that it disappeared on pulling out the eyepiece by about 3.6 mm., thus indicating that the nebular appearance was due to a want of definition produced by the different refrangibility of the light emitted by the Nova. He thinks that the object has never appeared so nebulous as it was in September 1892, and he suggests that this may be accounted for by the fact that the hydrogen line at $\lambda 486 \mu$ (F) and that at $\lambda 495 \mu$ have diminished in intensity.

THE APIS PERIOD OF THE ANCIENT EGYPTIANS.—The Apis Period of the ancient Egyptians formed the subject of a recent paper read before the Vienna Academy by Dr. E. Mahler. The author showed that this 25-year period could not